<u>In the claims:</u>

1. (previously presented) A method for managing alternate site switching in an optical communication system having a protected end-system in communication with a primary end-system over an optical communication network, the method comprising:

designating at least one backup end-system to back up the primary end-system;

constructing a failover tree through the optical communication system to the at least one backup end-system prior to a detection of a degradation or failure affecting the primary end-system;

<u>forwarding communications from the protected end-system to the primary end-system;</u>

detecting a degradation or failure affecting the primary end-system;

and

<u>upon detection of the degradation or failure affecting the primary end-system,</u> switching traffic from <u>forwarded by the protected end-system to</u> the primary end-system to one of said at least one backup end-system using the failover tree.

2. (original) The method of claim 1, wherein designating at least one backup end-system to back up the primary end-system comprises:

receiving a setup request from the protected end-system specifying the at least one backup end-system.

3. (original) The method of claim 1, wherein designating at least one backup end-system to back up the primary end-system comprises:

automatically discovering the at least one backup end-system using a predetermined auto-discovery mechanism.

4. (original) The method of claim 1, wherein constructing a failover tree to the at least one backup end-system comprises:

determining a root node for the failover tree; and constructing the failover tree rooted at the root node.

5. (original) The method of claim 4, wherein determining a root node for the failover tree comprises:

identifying a candidate node that is within a predetermined distance from the at least one backup end-system;

constructing a shortest-path spanning tree from the candidate node to the at least one backup end-system; and

selecting the candidate node as the root node if-and only if the shortest-path spanning tree does not include any link from the protected end-system to the candidate node.

6. (original) The method of claim 5, wherein identifying a candidate node that is within a predetermined distance from the backup end-system comprises:

using a marking scheme to identify the candidate node.

7. (original) The method of claim 5, wherein identifying a candidate node that is within a predetermined distance from the backup end-system comprises:

solving a geometrical problem to identify the candidate node.

8. (original) The method of claim 5, wherein constructing a shortest-path spanning tree from the candidate node to the at least one backup end-system comprises:

constructing the shortest-path spanning tree from the candidate node to the at least one backup end-system based upon topology information obtained from a routing protocol.

9. (original) The method of claim 4, wherein constructing the failover tree rooted at the root node comprises:

sending a setup request message specifying a failover tree structure to various nodes in the optical communication network;

reserving appropriate lightpath resources by nodes associated with a lightpath to the primary end-system; and

recording the failover tree structure by nodes associated with the failover tree.

10. (original) The method of claim 1, wherein detecting a degradation or failure affecting the primary end-system comprises at least one of:

monitoring a bearer channel between the primary end-system and a corresponding edge node in the optical communication network; and

querying the primary end-system by an optical-service agent in said corresponding edge node.

11. (original) The method of claim 1, wherein switching traffic from the primary end-system to one of said at least one backup end-systems comprises:

determining a failover node along the failover tree in the optical communication network;

establishing a backup lightpath from the failover node to a backup end-system; and switching traffic to the backup lightpath by the failover node.

12. (original) The method of claim 11, wherein determining a failover node along the failover tree in the optical communication network comprises:

propagating a release message upstream from a primary edge node associated with the primary end-system toward a predetermined root node of the failover tree;

receiving the release message by an intermediate node between the predetermined root node and the primary end-system; and

determining by said intermediate node that the intermediate node supports a backup end-system.

13. (original) The method of claim 11, wherein establishing a backup lightpath from the failover node to a backup end-system comprises:

sending a lightpath setup request message by the failover node downstream toward the backup end-system; and

reserving appropriate lightpath resources by a number of nodes between the failover node and the backup end-system.

14. (original) The method of claim 11, wherein switching traffic to the backup lightpath by the failover node comprises:

sending a connect message by a backup edge node associated with the backup end-system to the failover node; and

switching traffic to the backup lightpath by the .failover node upon receiving said connect message.

15. (original) The method of claim 11, further comprising:

relinquishing lightpath resources by a number of nodes from the failover node to the primary end-system.

16. (original) The method of claim 1, further comprising:

determining that the primary end-system is available; and switching traffic back to the primary end-system.

17. (original) The method of claim 1, further comprising:

determining that the primary end-system is available; and designating the primary end-system to back up the backup end-system.

18. (currently amended) A device for managing alternate site switching in an optical communication system having a protected end-system in communication with a primary end-system over an optical communication network, the device comprising:

backup end-system designation logic operably coupled to designate at least one backup end-system to back up the primary end-system; and

failover tree construction logic operably coupled to construct a failover tree to the at least one backup end-system prior to <u>detection of</u> actual failure or degradation of the primary end-system.

19. (original) The device of claim 18, wherein the backup end-system designation logic is operably coupled to receive a setup request from the protected end-system specifying the at least one backup end-system.

20. (original) The device of claim 18, wherein the backup end-system designation logic is operably coupled to automatically discover the at least one backup end-system using a predetermined auto-discovery mechanism.

21. (original) The device of claim 18, wherein the failover tree construction logic is operably coupled to determine a root node for the failover tree and construct the failover tree rooted at the root node.

22. (original) The device of claim 21, wherein the failover tree construction logic is operably coupled to determine a root node for the failover tree by identifying a candidate node that is within a predetermined distance from the at least one backup end-system, constructing a shortest-path spanning tree from the candidate node to the at least one backup end-system, and selecting the candidate node as the root node if and only if the shortest-path spanning tree does not include any link from the protected end-system to the candidate node.

23. (original) The device of claim 22, wherein the failover tree construction logic uses a marking scheme to identify the candidate node.

24. (original) The device of claim 11, wherein the failover tree construction logic solves a geometrical problem to identify the candidate node.

25. (original) The device of claim 22, wherein the failover tree construction logic constructs the shortest-path spanning tree from the candidate node to the at least one backup end-system based upon topology information obtained from a routing protocol.

26. (original) The device of claim 21, wherein the failover tree construction logic is operably coupled to construct the failover tree rooted at the root node by sending a setup request message specifying a failover tree structure to various nodes in the optical communication network.

27. (currently amended) A device for managing alternate site switching in an optical communication system having a protected end-system in communication with a primary end-system over an optical communication network, the device comprising:

a failover tree database for recording the structure of a failover tree having at least a root node, the failover tree computed prior to a detection of a degradation or failure affecting the primary-end system;

detection logic operably coupled to detect ~~a~~ the degradation or failure affecting the primary end-system; and

signaling logic operably coupled to send a release message upstream toward the root node over the failover tree when the detection logic detects the degradation or failure affecting the primary end-system to release light-path resources to the primary end-system .

28. (original) The device of claim 17, wherein the detection logic is operably coupled to detect a degradation or failure affecting the primary end-system by at least one of:

monitoring a bearer channel to the primary end-system; and

querying the primary end-system.

29. (original) The device of claim 27, further comprising:

lightpath logic operably coupled to relinquish lightpath resources associated with a primary lightpath to the primary end-system.

30. (currently amended) A device for managing alternate site switching in an optical communication system having a protected end-system in communication with a primary end-system over an optical communication network, the device comprising:

a failover tree database for recording the structure of a failover tree having a backup end-system, the failover tree being identified prior to failure of the primary end-system ;[[;]]

first receiving logic operably coupled to receive a release message; and switching logic operably coupled to switch traffic from a primary end-system to a backup end-system using the prior constructed failover tree when the first receiving logic receives the release message.

31. (original) The device of claim 30, wherein the switching logic is operably coupled to send a lightpath setup request message downstream toward the backup end-system to establish a backup lightpath, reserve lightpath resources for the backup lightpath, and switch traffic to the backup lightpath.

32. (currently amended) An optical communication system for managing alternate site switching, the optical communication system comprising a plurality of end-systems including a protected end-system, a primary end-system, and at least one backup end-system coupled over an optical communication network, wherein each end-system interfaces with the optical communication network through a corresponding optical edge node, and wherein a failover tree is constructed to the at least one backup end-system prior to a detection of a failure of the primary end-system, and traffic is switched from the primary end-system to a backup end-system upon detecting a degradation or failure affecting the primary end-system.

33. (original) The optical communication system of claim 32, wherein the protected end-system is operably coupled to send a setup request message to its corresponding optical edge node indicating the at least one backup end-system.

34. (original) The optical communication system of claim 33, wherein the optical edge node corresponding to the protected end-system is operably coupled to automatically discover the at least one backup end-system using a predetermined auto-discovery mechanism.

35. (original) The optical communication system of claim 33, wherein the optical edge node corresponding to the protected end-system is operably coupled to construct the failover tree to the backup end-system.

36. (original) The optical communication system of claim 35, wherein the optical edge node corresponding to the protected end-system is operably coupled to determine a root node for the failover tree and construct the failover tree rooted at the root node.

37. (original) The optical communication system of claim 36, wherein the optical edge node corresponding to the protected end-system is operably coupled to determine a root node for the failover tree by identifying a candidate node that is within a predetermined distance from the at least one backup end-system, constructing a shortest-path spanning tree from the candidate node to the at least one backup end-system, and selecting the candidate node as the root node if and only if the shortest-path spanning tree does not include any link from the protected end-system to the candidate node.

38. (original) The optical communication system of claim 36, wherein the optical edge node corresponding to the protected end-system is operably coupled to send a setup request message specifying a failover tree structure to various nodes in the optical communication network.

39. (original) The optical communication system of claim 38, wherein nodes associated with a primary lightpath to the primary end-system are operably coupled to reserve appropriate lightpath resources for the primary lightpath to the primary end-system.

40. (original) The optical communication system of claim 38, wherein nodes associated with the failover tree are operably coupled to record the failover tree structure.

41. (original) The optical communication system of claim 32, wherein the optical edge node associated with the primary end-system is operably coupled to detect a degradation or failure affecting the primary end-system.

42. (original) The optical communication system of claim 41, wherein the optical edge node associated with the primary end-system is operably coupled to detect a degradation or failure affecting the primary end-system by at least one of:

monitoring a bearer channel between the primary end-system and a corresponding edge node in the optical communication network; and

querying the primary end-system by an optical service agent in said corresponding edge node.

43. (original) The optical communication system of claim 41, wherein the optical edge node associated with the primary end-system is operably coupled to send a release message upstream toward a root node of the failover tree upon detecting a degradation or failure affecting the primary end-system.

44. (original) The optical communication system of claim 43, wherein a failover node of the failover tree is operably coupled to establish a backup lightpath from the failover node to a backup end-system and switch traffic to the backup lightpath by the failover node upon receiving the release message.

45. (original) The optical communication system of claim 44, wherein the failover node is operably coupled to send a lightpath setup request message downstream toward the backup end-system in order to establish a backup lightpath.

46. (original) The optical communication system of claim 45, -wherein a number of nodes between the failover node and the backup end-system are operably coupled to reserve appropriate lightpath resources for the backup lightpath.

47. (original) The optical communication system of claim 45, wherein the failover node is operably coupled to switch traffic to the backup lightpath upon receiving a connect message from the optical edge node associated -with the backup end-system.

REMARKS

Reconsideration and further examination is respectfully requested.

Response to Advisory Action

This paper is a preliminary amendment filed with a Request for Continued Examination. The below comments will address rejections previously put forth in the Final Office Action mailed November 21, 2005. However, before going into these remarks, Applicants would like to address a comment made by the Examiner in the Advisory Action mailed March 15, 2006.

In the Advisory Action, the Examiner stated:

"... The applicant argues that the cited art does not teach, "constructing a failover tree .... prior to a detection of a degradation or failure affecting the primary end system" The examiner asserts that Lamport explicitly discloses such limitations. The examiner references col. 63 lines 1048 where Lamport discloses using a multiplicity of switches forming a spanning tree, each switch containing a configuration change detection means for detecting a link failure and a new connection being formed... that new connection may be broadly interpreted as the switching of a failed link to an alternate link ... *Furthermore, Lamport discloses a reconfiguration means coupled to the configuration change detection means which is activated* ***only after a configuration detection is experienced****..."*

The Applicants note that their claims are clearly drawn to a method and apparatus that constructs failover trees *prior* to any actual failure in the system. The Examiner clearly recognizes that Lamport does not change links until *"only after"* a failure is detected. Thus, as detailed below, the teachings of Lamport are fundamentally opposite of that of the claimed invention. The Examiner appears to recognize this fact, but is not giving patentable weight to the term 'prior', which is used in the claims. Applicants have further amended the claims in an